HW: p. 132

1-2, 4-10

Normal Model:

- Question: How do you compare data that measure different things?

- To compare data, we must standardize the data.

- z-Score:

$$z = \frac{y - \bar{y}}{s}$$

y: a piece of data
$\bar{y}$: mean
s: standard deviation

z-scores do NOT have units

On one test your class achieved an average grade of 80 with a standard deviation of 8 points.

a) If you got a 96, what's your z-score?

b) Your best friend got a 76. What's her z-score?

c) What test grade has a z-score of +1.5?

d) The teacher calls home whenever a student's z-score is worse than -2.0. What grade earns you that phone call?

$\bar{y} = 80 \qquad s = 8$

a) $z = \frac{y - \bar{y}}{s}$

$= \frac{96 - 80}{8}$

$= 2$

b) $z = \frac{y - \bar{y}}{s}$

$= \frac{76 - 80}{8}$

$= -0.5$

c) $z = \frac{y - \bar{y}}{s}$

$sz = y - \bar{y}$

$y = sz + \bar{y}$

$= (8)(+1.5) + 80$

$= 92$

d) $z = \frac{y - \bar{y}}{s}$

$y = sz + \bar{y}$

$= (8)(-2) + 80$

$= 64$

- Standardizing Data:
  - We do two things:
    1. Shift data by subtracting mean.
    2. Divide by the standard deviation.
  - After we do both these things, new standard deviation becomes 1.
  - Changes (or not) of data:

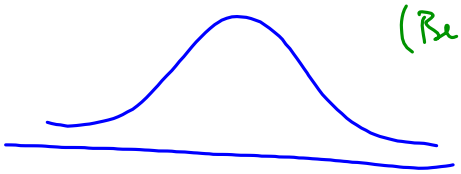
Standardizing into z-scores...

(modality)

- does NOT change shape of distribution.
- DOES change the center (mean) by making it 0.
- DOES change spread (standard deviation) by making it 1.

- What do z-scores mean?
  - A z-score of 0 is at the mean.
  - A z-score of ±1 means that data is ±1 STANDARD DEVIATIONS from mean.

- Normal Model:



  - This model shows up over and over again in statistics
  - Use normal model for distributions that are unimodal and roughly symmetric.
  - "All models are wrong - but some are useful." - George Box
  - Mathematical representation:

$$N(\mu, \sigma)$$

"sigma" → standard deviation

"mu" → mean

μ and σ are parameters of the model!

  - Create a z-score for normal model: $z = \frac{y - \mu}{\sigma}$

- Nearly Normal Condition:

  Shape of distribution is unimodal and symmetric; check by making histogram.

- 68 - 95 - 99.7 Rule